

## CLAIMS

1. A method for determining the effect of a plurality of culture conditions on a cell, comprising the steps of:
  - (a) providing a first set of groups of cell units each comprising one or more cells, and exposing said groups to desired culture conditions;
  - (b) subdividing one or more of said groups to create a further set of groups of cell units;
  - (c) exposing said further groups to further desired culture conditions;
  - (d) optionally, repeating steps (b) – (c) iteratively as required; and
  - (e) assessing the effect on a given cell unit of the culture conditions to which it has been exposed.
2. A method for determining the effect of a plurality of culture conditions on a cell, comprising the steps of:
  - a) providing a first set of groups of cell units each comprising one or more cells, and exposing said groups to desired culture conditions;
  - (b) pooling two or more of said groups to form at least one second pool;
  - (c) subdividing the second pool to create a further set of groups of cell units;
  - (d) exposing said further groups to desired culture conditions;
  - (e) optionally, repeating steps (b) – (d) iteratively as required; and
  - (f) assessing the effect on a given cell unit of the culture conditions to which it has been exposed.
3. A method for exposing a cell to a variety of cell culture conditions, comprising the steps of:
  - a) providing a first set of groups of cell units each comprising one or more cells, and exposing said groups to desired culture conditions;
  - (b) pooling two or more of said groups to form at least one second pool;
  - (c) subdividing the second pool to create a further set of groups of cell units;
  - (d) exposing said further groups to desired culture conditions; and
  - (e) optionally, repeating steps (b) – (d) iteratively as required.
4. A method for determining the effect of a plurality of culture conditions on a cell, comprising the steps of:

a) providing a first set of groups of cell units each comprising one or more cells, and exposing said groups to desired culture conditions;

(b) pooling two or more of said groups to form at least one second pool;

(c) subdividing the second pool to create a further set of groups of cell units;

(d) exposing said further groups to desired culture conditions;

(e) optionally, repeating steps (b) – (d) iteratively as required; and

(f) assessing the effect on a given cell unit of the culture conditions to which it has been exposed.

5. A method according to claims 1 to 4 wherein cell units are labelled and the label(s) reflect(s) the culture conditions to which the cell unit has been exposed.

6. A method according to any preceding claim, wherein the label is spatially encoded.

7. A method according to any one of claims 1 to 5, wherein the label is selected from the group consisting of an oligonucleotide, a peptide, a fluorescent compound, a secondary amine, a halocarbon, a mixture of stable isotopes, a bar code, an optical tag, a bead and a radiofrequency encoding tag.

8. A method according to any preceding claim, wherein the cells are cultured in cell units, each cell unit comprising one or more cells.

9. A method according to claim 8, wherein the cell units are single cells.

10. A method according to claim 8, wherein each cell unit comprises one or more cells adherent to or bounded by a solid substrate.

11. A method according to claim 10, wherein the solid substrate is a microcarrier or bead.

12. A method according to claim 10, wherein the solid substrate is a well or medium-permeable barrier.

13. A method according to any preceding claim, wherein the culture conditions are media to which the cell is exposed.

14. A method according to claim 13, wherein the media contain one or more specific agents which influence a cellular process.
15. A method according to any preceding claim, wherein the cell culture conditions comprise culturing at one or more specific temperatures.
16. A method according to any preceding claim, wherein the cell culture conditions comprise culturing on one or more specific substrates.
17. A method for identifying a gene which influences a cellular process, comprising the steps of:
- a) determining the effect of one or more culture conditions on a cell unit, in accordance with any one of the preceding claims;
  - b) analysing gene expression in said cell units when exposed to said culture conditions; and
  - c) identifying genes which are differentially expressed under desired culture conditions.
18. A method according to claim 17, wherein the desired culture conditions influence a cellular process.
19. A method for producing a nucleic acid which encodes a gene product which influences a cellular process, comprising identifying a gene in accordance with claim 17 or claim 18, and producing at least the coding region of said gene by nucleic acid synthesis or biological replication.
20. A method for inducing a cellular process, comprising the steps of:
- a) identifying one or more genes which are differentially expressed in association with the cellular process in accordance with claim 17 or claim 18; and
  - b) modulating the expression of said one or more genes in the cell.
21. A method according to claim 20, wherein modulation of gene expression in the cell comprises transfection of said one or more genes into the cell.

22. A method according to claim 20, wherein modulation of gene expression comprises the exogenous administration of a gene product.

23. A method for identifying the state of a cellular process of a cell, comprising the steps of:

a) identifying one or more genes which are differentially expressed in association with the cellular process in accordance with claim 17 or claim 18; and

b) detecting the modulation of expression of said one or more genes in a cell, thereby determining the state of the cellular process of said cell.

24. A method according to claim 23, wherein said one or more genes encode a marker.

25. A method according to claim 24, wherein said marker may be detected by an immunoassay.

26. A method for inducing a cellular process, comprising the steps of:

a) determining the effect of one or more culture conditions on a cell unit, in accordance with any one of claims 1 to 16;

b) exposing a cell to culture conditions which induce the cellular process; and

c) isolating the desired cell.

27. A method for identifying an agent which is capable of inducing a cellular process, comprising the steps of:

a) determining the effect of one or more agents on a cell unit, in accordance with any one of claims 1 to 16; and

b) identifying those agent(s) which induce the cellular process in the cell units.

28. A method for preparing an agent which is capable of inducing a cellular process, comprising the steps of:

a) determining the effect of one or more agents on a cell unit, in accordance with any one of claims 1 to 16;

b) identifying those agent(s) which induce the desired cellular process in the cell units; and

c) synthesising or isolating the agent(s).

29. A method according to any of claims 17, 18, 19, 20, 23, 26, 27 or 28 where the cellular process is cell proliferation or differentiation.
30. A method for culturing stem cells or cells that have been derived from stem cells in vitro, comprising the steps of:
- a) combining one or more cultures of cells grown under different conditions; and
  - b) culturing the cells.
31. A method for culturing stem cells or cells that have been derived from stem cells in vitro comprising the steps of:
- a) incubating a stem cell culture; and
  - b) splitting said culture into two or more groups of stem cells, and culturing said group of stem cells under two or more different sets of culture conditions.
32. A method according to claim 30 or claim 31, wherein the cells are cultured in cell units, each cell unit comprising one or more cells.
33. A method according to claim 30 or claim 31, wherein the cell units are single cells.
34. A method according to claim 30 or claim 31, wherein each cell unit comprises one or more cells adherent to or bounded by a solid substrate.
35. A method according to claim 34, wherein the solid substrate is a microcarrier or bead.
36. A method according to claim 34 wherein the solid substrate is a well or medium-permeable barrier.
37. A method for culturing stem cells, comprising growing said stem cells adhered to a microcarrier or bead.
38. A method according to claim 37, wherein said stem cells are subjected to at least one change of culture conditions.

39. A method according to claim 38, wherein said change of culture conditions comprises a change of medium.
40. A method according to any one of claims 37 to 39, wherein the process is scaled up such that at least 50g (dry weight) of microcarrier is employed.
41. A method for obtaining differentiated cells from stem cells in vitro, comprising the steps of:
- (a) Growing stem cells adherent to microcarriers in a culture medium;
  - (b) Transferring the microcarriers from one culture medium to another;
  - (c) Optionally repeating step (b) as required; and
  - (d) Obtaining the differentiated cells attached to the microcarrier.
42. A method according to the preceding claim, wherein the process is scaled up such that at least 50g (dry weight) of microcarrier is employed.
43. A method according to claim 38 or 39, wherein the differentiated cells are isolated by enzymatic detachment from the microcarrier.
44. A method according to claim 38 or 39, wherein the differentiated cells are isolated by digestion of the microcarrier.
45. A method of growing pluripotent stem cells in vitro comprising the steps of:
- (a) seeding said cells on microcarriers; and
  - (b) propagating the cells while attached to the carriers.